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COLLISION OF HUBERT ROTEN TRUCKING COMPANY TRUCK AND SKINNER CORPORATION BUS NEAR HAMILTON, GEORGIA, JUNE 6, 1975

NATIONAL TRANSPORTATION SAFETY BOARD

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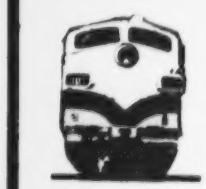

WASHINGTON, D.C. 20594

HIGHWAY ACCIDENT REPORT

COLLISION OF
HUBERT ROTEN TRUCKING COMPANY
TRUCK AND SKINNER CORPORATION BUS

NEAR HAMILTON, GEORGIA

JUNE 6, 1975

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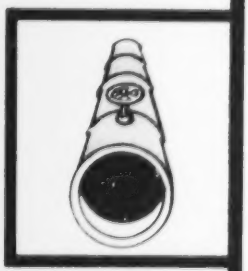

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16. Abstract

At 6 p.m. on June 6, 1975, a southbound tractor-semitrailer (truck) collided with a northbound intercity-type bus near Hamilton, Georgia. The bus was the second vehicle of a four-vehicle convoy. Two southbound automobiles were waiting for the convoy to pass before the first could turn left into a driveway. The truck was following the automobiles; when the truckdriver attempted to avoid the cars, his truck jackknifed and collided with the bus. The vehicles collided on a two-lane highway in a sparsely populated, rural area; a light-to-moderate rainshower was in progress. The truckdriver and busdriver were killed in the collision and 19 of the 20 bus passengers were injured.

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the truckdriver to operate at a proper speed and with a proper level of attention to and concern for safe driving.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594

HIGHWAY ACCIDENT REPORT

Adopted: May 12, 1976

COLLISION OF HUBERT ROTEN TRUCKING COMPANY TRUCK AND SKINNER CORPORATION BUS NEAR HAMILTON, GEORGIA, JUNE 6, 1975

SYNOPSIS

At 6 p.m. on June 6, 1975, a southbound tractor-semitrailer (truck) collided with a northbound intercity-type bus near Hamilton, Georgia. The bus was the second vehicle of a four-vehicle convoy. Two southbound automobiles were waiting for the convoy to pass before the first could turn left into a driveway. The truck was following the automobiles; when the truckdriver attempted to avoid the cars, his truck jackknifed and collided with the bus. The vehicles collided on a two-lane highway in a sparsely populated, rural area; a light-to-moderate rainshower was in progress. The truckdriver and busdriver were killed in the collision and 19 of 20 bus passengers were injured.

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the truckdriver to operate at a proper speed and with a proper level of attention to and concern for safe driving.

INVESTIGATION

The Accident

At 6 p.m. on June 6, 1975, an intercity-type bus was traveling north on U.S. 27 through a sparsely populated, rural area near Hamilton, Georgia. A light-to-moderate rainshower was in progress. The bus, en route from Columbus, Georgia, to Callaway Gardens, Georgia, was the second vehicle of a four-vehicle convoy; the first vehicle, a Georgia State Highway Patrol car, was escorting the convoy. (The bus was transporting the Secretary of the Army, a group of U.S. Congressmen, and other dignitaries.) The convoy vehicles were traveling with headlights on in compliance with the Georgia Traffic Code. Neither the dome unit on the highway patrol car nor any auxiliary flashers or similar lights were being used by the convoy vehicles.

As the convoy, which was traveling at 40 to 45 mph on the two-lane highway, began to ascend a 1-mile-long, 5- to-6-percent grade, an automobile stopped in the southbound lane to wait for traffic to pass before turning left into a private driveway; a second car also stopped behind the automobile. The automobile which was waiting to turn left was not traveling with headlights on; the second automobile was traveling with headlights on. The driver of the second car was waiting for the first car to complete its turn in order to continue travel along U.S. 27. Both the taillights and brake lights of the second car were inspected after the accident and were found to have clear lenses and to be in working condition.

The driver of the lead automobile stated that he activated his left turn signal and began to stop "at the top of the hill." Occupants of the second automobile indicated that they were traveling at a speed of 50 mph or less and were following closely but safely behind the lead automobile when its driver began to signal and stop for the left turn. The occupants of the automobiles reported only normal brake applications.

An occupant of the second automobile stated that when his automobile was about 80 feet from a stop, he heard a sound similar to that of a truck changing gears; he looked back and saw a tractor-semitrailer (truck) about 75 yards to the rear and overtaking his automobile.

As the convoy's escort vehicle passed the two stopped automobiles, its driver saw that the truck was traveling downhill "at too high a speed (50 mph or more) given the two stopped vehicles just ahead in the truck's direction of travel," and he flashed his headlights at the truck. According to the witness, as he looked in his rearview mirror, he saw the tractor pitch forward as if the brakes had been applied and then swerve left into the front of the bus.

Witnesses in a vehicle behind the convoy reported that the truck began to weave from side to side as it passed the escort vehicle and as it was leaving a slight curve to its right. The tractor jackknife

suddenly to the left, and the truck crossed the centerline. The right front of the tractor struck the left front of the bus; the tractor then spun violently to its left and crashed against the left side of the trailer. The unit slid broadside to its right and the leading edge of the left side of the trailer contacted the rear left side of the bus; the truck came to rest partially off the pavement. The pavement was covered with diesel fuel after the collision, but the fuel did not ignite.

Seats, passengers, and loose objects were thrown forward and to the left inside the bus on impact; then, as the bus slid to its right, seats, passengers, and loose objects were thrown to the right. The bus came to rest off the pavement. The two stopped automobiles were not hit.

U.S. Route 27 is a north-south highway near the western border of Georgia. The posted speed limit for automobile traffic was 55 mph, and for buses and trucks of the type involved in this accident, 45 mph. The vehicles collided on a two-lane, two-way section of asphalt highway which was 24 feet wide. The bus had descended a short, straight grade and had ascended about 300 feet of straight roadway; it was continuing uphill and approaching a curve to its left when the vehicles collided. (See Figure 1.)

The truck had almost reached the end of a 1-mile downgrade when it hit the bus. There were no structures, driveways, or intersecting roads along the section of downgrade before the accident site. The truck was traveling on a straight section of road and approaching a 500-foot-long, slight curve to the right when the automobiles ahead began to stop.

To the truckdriver's right, the roadside had been cleared of fixed objects for 25 feet. A drainage ditch with a 2-to-1 slope ratio paralleled the road at the edge of the 8-foot-wide, slightly sloped shoulder. To the truckdriver's left, the roadside had been cleared of fixed objects for 20 feet. Another drainage ditch paralleled the road at the edge of the 8-foot-wide shoulder. From 1973 to 1975, there had been no accidents at this location.

The accident occurred during daylight and during a light-to-moderate rainshower. No road drainage problems were observed during a similar rainshower. The road surface, when wet, had a skid resistance value of 0.40g as measured by a skid trailer and according to American Society of Testing and Materials (ASTM) test procedure 274-70. According to the State of Georgia's criteria, this value indicated that the frictional properties of the pavement were fair-to-good. (An excellent rating is 0.50g.) Witnesses' statements indicated that the rain did not reduce visibility significantly.

Figure 1. View of accident scene. Skidmarks visible on right lane are not from the bus involved in the accident.

Injuries to Persons

Injuries	Drivers	Passengers	Other
Fatal	2		
Nonfatal		19	
None		1	

Damage to Vehicles

The bus -- The bus was a 1969 GMC 41-passenger Land Cruiser, Model PD 4107, which had been purchased stripped and modified. (See Figure 2.) The bus was owned and operated by the Skinner Corporation of West Point, Georgia.

At impact, all seats in the front of the bus failed at their floor anchorage points. All but one seat support at the right rear of the front half of the bus failed at their wall anchorage points. The seat anchorage system consisted of fixed stainless steel clips mounted on threaded bolts which were attached to the aisle leg and to the wall side of each seat. Each clip was inserted into slotted tracks that were mounted on the floor and on the wall of the bus. A nut and a lock washer on the threaded bolt were tightened against the outside of the track to lock the seat to the track. During the collision, the clips bent and the slots in the track widened to permit failure of each anchorage system.

The bus' exterior was damaged extensively on the left front and on the left side near the driver's seat. The underframe buckled to the second bulkhead behind the front wheels. (See Figure 3.) The exterior also was damaged on the left rear side. The bus windows released at impact.

The tractor -- The tractor was a 1974 Mack with 3 axles and twin screws, a 6-cylinder Maxidyne No. 300 diesel engine with a Dynatard engine brake, a TRXL 107, 6-speed maxitorque transmission, and air brakes. It was owned by the Hubert Roten Trucking Company of Union Springs, Alabama. The tractor was equipped with front brakes; the device for the front brakes' proportioning valve, which limits the braking capability at the front steering axle during wet weather, was set at "dry." The Dynatard engine brake was not in use. The Safety Board could not determine which transmission gear was engaged at impact.

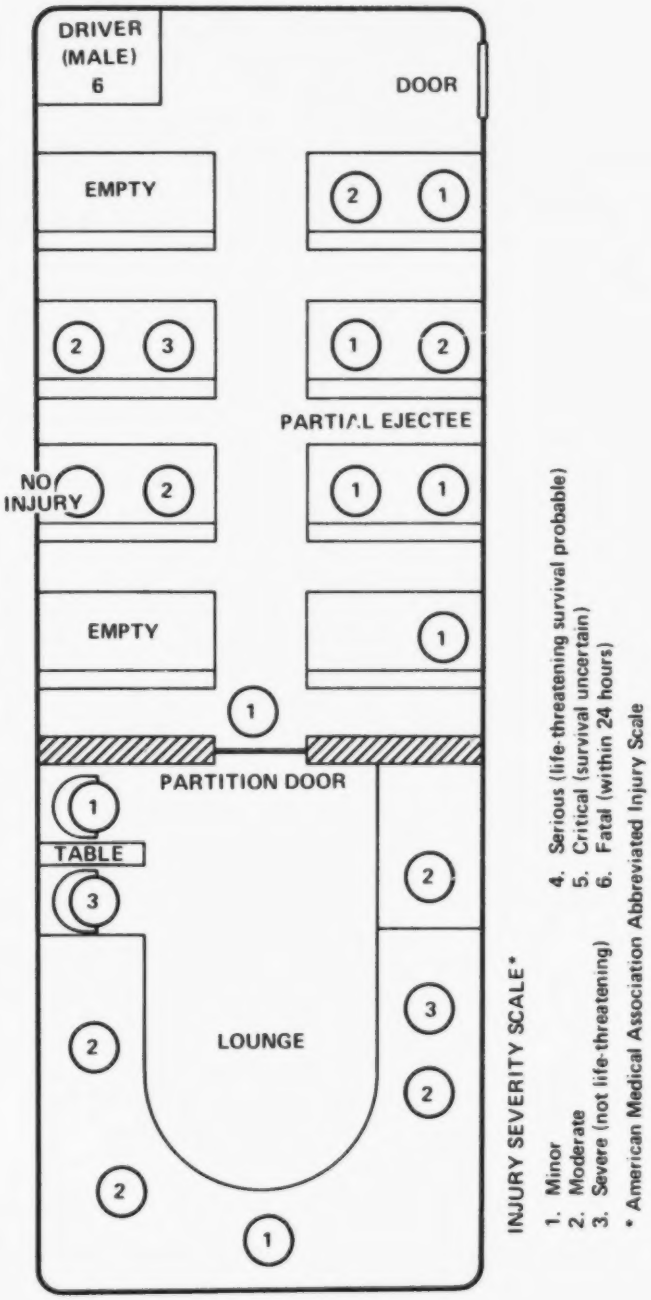

Figure 2. Injury severity by seating position.

Figure 3. Crash damage which was sustained by the bus.

The air brake system was tested; no air loss was detected. The thickness of the brake lining and the clearances between the lining and the bruke drum were within acceptable values at each wheel. The brake lining surfaces were in good condition. The slack adjustment could not be measured because the wrecker driver altered the adjustment to free the emergency spring brakes.

The tractor was damaged extensively. (See Figure 4.) The major damage appeared to have been produced when the front of the tractor struck the front of the bus. The damage to the left side of the cab and the forward half of the trailer's left side indicated that the left side of the cab had struck the trailer during the collision.

The semitrailer -- The semitrailer was a 1973 Felts Model FLT 3040 flatbed trailer which was equipped with side stanchions to haul logs. (See Figure 5.) It was equipped with a tandem axle suspension and air brakes. It was owned by the Daniels Sawmill in Union Springs, Alabama, and was empty at the time of the accident.

The trailer's braking system was tested; no air loss was detected. Damage to the semitrailer indicated that the front left side of the trailer had struck the left side of the tractor cab and that the leading edge of the trailer's left front had struck the rear left side of the bus. The main longitudinal frame rails of the trailer were buckled.

Driver Information

The truckdriver was a 52-year-old resident of Union Springs, Alabama. He held a valid Alabama operator's license, but he had no medical certificate as required by Federal Motor Carrier Safety Regulations (FMCSR). The Hubert Roten Trucking Company was engaged in interstate commerce and, therefore, both the driver and the vehicle were subject to FMCSR's; the company had not been served with a copy of the FMCSR by the Bureau of Motor Carrier Safety of the Federal Highway Administration. Although the driver did not have a medical certificate, there was no evidence to indicate that he was incapacitated and he had no history of medical problems.

According to Section 395.3 of the FMCSR, "no motor carrier shall permit or require any driver used by it to drive nor shall any such driver drive more than 10 hours following 8 consecutive hours off-duty or drive for any period after having been on duty 15 hours following 8 consecutive hours off-duty." 1/

1/ Federal Motor Carrier Safety Regulations; U.S. Department of Transportation; Federal Highway Administration; Bureau of Motor Carrier Safety.

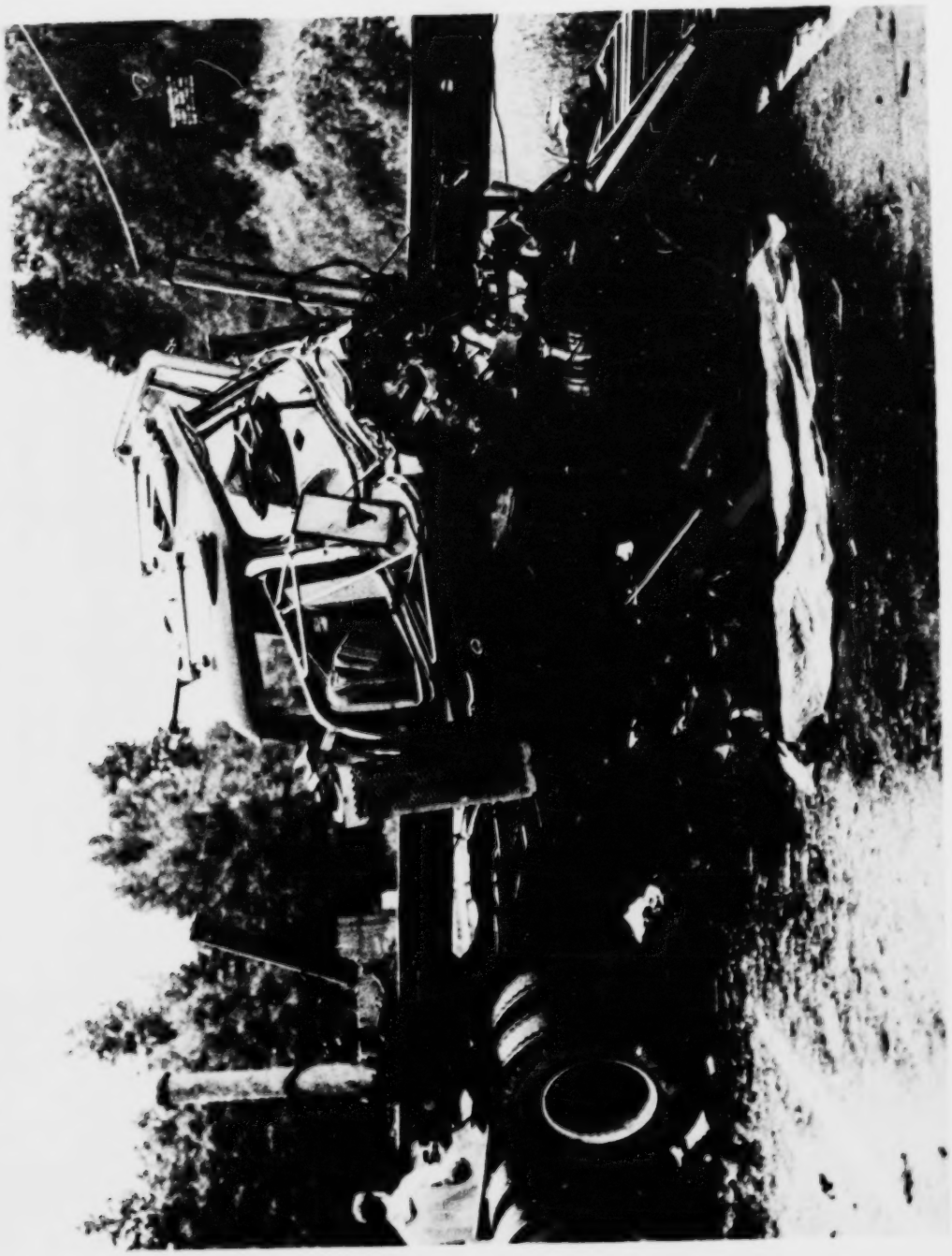

Figure 4. Crash damage which was sutained by the tractor.

Figure 5. Crash damage which was sustained by the trailer.

During the week of June 1 through 6, 1975, the driver had transported 8 loads of logs from Union Springs, Alabama to various points in Alabama and Georgia within a 100 mile radius of Union Springs. On the day of the accident he had made a round trip from Union Springs, Alabama, to Warm Springs, Georgia, arriving at Warm Springs at 6:50 a.m. He left Union Springs for a second repeat trip at about 2 p.m., weighed in at Warm Springs at 5:10 p.m., and departed at 5:30 p.m., en route home. Assuming a 3-hour trip one-way, the driver had probably begun his work day at about 4 a.m. At the time of the accident he had been on duty for not more than 14 hours, had been driving about 9½ hours, and was within the limits of Section 395.3 of the FMCSR.

Survival Aspects

The busdriver and the truckdriver were killed in the collision. Of the 19 injured bus passengers, the most seriously injured received leg and rib fractures and concussions. One passenger in the rear of the bus received a fractured rib when he came in contact with an unanchored table, and another rear passenger was injured when he came in contact with a shattered, wall-mounted mirror.

Passengers in the front of the bus became entangled with loose seats and other passengers. Two passengers were ejected partially through the windows on the right side of the bus. The door at the right front of the bus was blocked by debris and the door in the center partition was blocked and jammed; however, the passengers were able to clear away the debris, open the doors, and exit within a few minutes.

ANALYSIS

Preimpact Truck Operation

Based on witness statements, there were three possible points at which the truckdriver may have realized that he had to stop: (1) The point where the truckdriver reportedly attempted to shift, (2) the point where the truck began to weave as it left the curve, about 135 feet before it struck the bus, and about 215 feet from potential impact with the stopped cars, and (3) the point where the escort officer saw the tractor pitch forward as though the brakes had been applied hard just before it jackknifed into the bus.

The weaving of the truck could have been caused by (a) an attempt to downshift, which could have produced a sudden retarding force at the drive axles and the truck would have become unstable; (b) a relatively hard brake application which, when performed on an unloaded truck at high speed and on wet pavement, may produce a laterally unstable stop; (c) an initiated but aborted attempt to steer the truck around the stopping cars ahead; or (d) some combination of shifting, steering, or braking. Since the curve was easily negotiable, even at high speed, it is not likely that the weaving was induced by a normal maneuver through the curve.

Calculations performed by the Safety Board indicate that the truck was traveling about 50 to 55 mph at impact. If the weaving motion was produced by a brake application, the speed of the truck before the weaving began would have been higher than the 50- to 55-mph impact speed. With locked wheel braking efficiency during the 135 feet of braking distance, the truck could have been traveling at a speed as high as 63 mph before it began to weave. If, however, the brakes were not applied firmly until just before the truck jackknifed (as described by the escort officer), or the only braking force was as a result of the jackknife, the traveling speed of the truck would not have been appreciably greater then its impact speed. Therefore, 55 mph was probably the minimum speed of the truck.

Based on the foregoing, the Safety Board concludes that the truck was traveling between 55 to 63 mph before the truckdriver began any observed action that significantly reduced his speed and it became directionally unstable as a result of some combination of attempting to shift, steer, or brake the vehicle. No conclusions could be reached concerning the sequence and appropriateness of the truckdriver's emergency actions based on witnesses' statements because each action was described by a different witness, and there was no physical evidence (skidmarks, etc.) to indicate what actions occurred before the crash. The witness statements do indicate there was significant delay in reaction by the truckdriver, however. Even if it is assumed that where the truckdriver first became aware of the developing situation ahead was when he reportedly attempted to shift, he had traveled at least 725 feet over a time span of 9 seconds before he reacted to the first automobile's beginning to stop.

In an attempt to determine possible reasons for delay by the truckdriver, visibility tests were conducted that duplicated the eye level of the truckdriver during his descent of the grade. These tests indicated that he had a continuous, clear, and unobstructed view of the second automobile and its signals from 2,000 feet before the driveway. He would have been in a position to note the second automobile's brake application from its onset and would have had continuous input to advise him that he was overtaking the two automobiles.

Although the truckdriver had not exceeded the on-duty and driving time limits established by Federal Motor Carrier Safety Regulations, his downhill traveling speed, his failure to set the front-brake proportioning valve for wet weather, and his long work day suggest that he was driving with a marginal level of attention to and concern for safe driving.

Accident Avoidance Measures

A further refinement of automobile rear signal systems may have been of value in preventing this accident. The second automobile, in combination

with the roadway geometry, may have served to initially shield the turn signal of the lead automobile. With normal braking (0.2g) for the second automobile as it stopped from 50 mph or less, it would have stopped in about 420 feet, or 11 1/2 seconds. Assuming a 2- to-3-second delay before the second automobile driver reacted to the automobile braking ahead, the lead automobile would have stopped in about 500 feet, or 14 seconds. If the witness testimony regarding the attempted shift is accurate, at 55 mph the truck would have been about 600 feet behind the second automobile when the lead automobile began to stop. Other witnesses indicated that the truck was about 225 feet behind the second automobile after both automobiles had stopped. At 55 mph, the truck would have been about 750 feet behind the second automobile when the lead automobile began to stop.

Since about 500 feet were required for the two automobiles to stop, these vehicles began to brake shortly after they entered the curve to the right. Since there was a long distance between the truck and the two cars, and since the cars were close together and traveling around the curve to the right when they began to stop, the second automobile could have initially shielded the truckdriver's view of the lead car's turn signal. Normally a truckdriver can see over a shielding car because he is sitting high above the road. However, when there is a considerable distance between the truck and vehicles ahead and the cars are traveling close together, he loses this advantage. In an earlier report, the Safety Board recommended that the National Highway Traffic Safety Administration take necessary actions to insure maximum detectability of signals given a shielding vehicle of similar character. 2/ Basically, this report stated that elevating the rear signal system should serve to alert drivers traveling behind the shielding vehicle and that concept may be applied to this situation.

The character of the offroad features would not have alerted the truckdriver that vehicles might turn at this location. The driveways were obscure and the dwellings they led to were shielded by trees and other offroad features. The Safety Board believes that a sign that would advise motorists to "Watch for turning traffic" placed appropriately at the beginning of the section of high-speed rural highway where the highway was intersected by other roads and driveways may have served to warn the truckdriver of the potential hazard ahead. Currently, signs of this type are being used experimentally in the States of Pennsylvania and Virginia.

Survivability Aspects

The failure of the bus seat anchorages in the front half of the bus did not appear to significantly increase the level of injury to bus passengers. Since the seats yielded on impact, they did not present a rigid surface for most passengers to strike. This yielding effect

2/ National Transportation Safety Board, "Highway Accident Report -- Multiple Vehicle Collisions in Fog, Near Corona, California, February 28, 1975," NTSB-HAR-75-7.

seemed to have outweighed any negative influence of passengers being loaded by other seats and passengers. However, loose seats blocked access to the right front door and to emergency equipment. Passengers and seats became entangled; this confusion reduced the opportunity for a rapid escape from the bus. Fortunately, there was no postcrash fire or other emergency in which these results would have increased injury. 3/

Some front and rear area passengers who were not retained in their seats were exposed to injury when they came into contact with surfaces which they would not have otherwise struck. Although the Safety Board has recommended that standards for safety belts and for bus seat performance in a crash environment be established, no standards have been established by the National Highway Traffic Safety Administration.

CONCLUSIONS

(a) Findings

1. The truckdriver did not react to the two automobiles stopping ahead in his lane of travel in sufficient time to stop his truck safely.

2. Although the posted speed limit for trucks of the type involved in this accident was 45 mph, this truck was traveling at least 55 mph.

3. The truckdriver's high rate of speed before the accident, his not setting the front brake proportioning valve for wet weather, and his long work day suggest that he was driving with a marginal level of attention to and concern for safe driving.

4. During the truckdriver's evasive maneuvers to avoid an accident, the truck became directionally unstable as a result of some combination of attempting to shift, steer, and brake the vehicle.

5. A further refinement of rear signal systems for automobiles may have been of value in preventing this accident.

6. A sign that would advise motorists to "Watch for turning traffic," currently being employed experimentally, may have served to warn the truckdriver of the potential hazard ahead.

7. Although the failure of the bus seat anchorages did not appear to increase significantly the overall level of injury to passengers, entanglement of the loose seats and passengers reduced the opportunity for a rapid escape from the bus.

3/ The Safety Board recently investigated a bus accident in which the seat anchorages failed; 19 passengers, although not significantly injured, were entangled within the loose seats and drowned in 28 inches of water: Jesus Ayala Schoolbus-Type Bus Run-off Roadway/Drainage Ditch Submerence; Blythe, California, January 15, 1974, NTSB-HAR-75-1.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the truckdriver to operate at a proper speed and with a proper level of attention to and concern for safe driving.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, JR.
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PHILIP A. HOGUE
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

May 12, 1976

APPENDIX

INVESTIGATION

This report is based upon an investigation by the National Transportation Safety Board under the authority of the Independent Safety Board Act of 1974. The Georgia State Patrol Fatal Collision Investigation Unit, Georgia State Patrol Post No. 2, the State of Georgia Department of Transportation, the National Highway Traffic Safety Administration, Georgia Mack Sales, the Mack Truck Company, General Motors Corporation, and American Seating were parties to the investigation.